Image credit: NASA

National Aeronautics and
Space Administration

Aeronautics

VTOL UAV With the Cruise Efficiency of a Conventional Fixed Wing UAV

A novel UAV design that enables vertical take-off and landing (VTOL) capability with long endurance flight

NASA Langley Research Center has developed Greased Lightning, the first UAV that combines vertical take-off and landing (VTOL) capability with long endurance flight. Previously these two capabilities have been considered mutually exclusive. For example, helicopters offer VTOL capability, yet are inefficient for long-endurance travel. The UAV market is large (multi-billion USD) and growing, with a global reach and many regional markets. This presents numerous opportunities and entry points for a new and superior UAV technology.

BENEFITS

- Combines vertical take-off and landing (VTOL) capability with long endurance flight enabled by the aerodynamic efficiency of the design
- Minimal takeoff/landing site requirements

technology solution

THE TECHNOLOGY

The core technology that enables the Greased Lightning UAV is the aerodynamic efficiency it achieves in its cruise configuration. Electric motors at each propeller negate the need for drive shafts and gearing which enables this Distributed Electric Propulsion (DEP) aircraft configuration. The design is intended to utilize a hybrid electric drive system that includes small diesel engines which drive alternators to power the electric motors and to charge an on-board battery system. The batteries provide the power boost needed for VTOL and hovering. Numerous other novel design elements are incorporated, such as folding propellers to minimize drag when not in operation, such that the propulsive efficiency can be nearly ideal at both hover and wing borne flight conditions.

Photograph of VTOL UAV prototype. Image credit: NASA

APPLICATIONS

The technology has several potential applications:

- Surveillance (optical, IR, SAR, and other sensor payloads)
- Live event coverage
- Large area field surveys
- Industrial inspections

PUBLICATIONS

Patent No: 9,475,579; 9,896,200

More Information

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